

**ABSTRACT**

5 The present invention relates to the use of diagnostic ultrasound and  
microbubble-based ultrasound contrast agents to accomplish noninvasive  
subharmonic aided pressure estimation (SHAPE) in the cavity of the heart, in other  
organs, and in major blood vessels. Diagnostic ultrasound provides noninvasive,  
real-time cross-sectional images and parameter estimations without ionizing  
radiation and without the disadvantages and risks of invasive methods of imaging  
and measurement. SHAPE is a non-invasive, direct, and accurate method for  
10 pressure estimation utilizing sub-harmonic or ultraharmonic signals from contrast  
agents. In light of the advantages of diagnostic ultrasound, SHAPE provides an  
economical alternative, a safe avenue, and an earlier timetable for assessing the  
clinical condition of patients, especially critically ill patients.